



Expediting RF Design for Tactical Common Data Link (TCDL)

CTT, Inc., Marketing Communications

Originally designed for voice transmission, military tactical radios are now used to transmit and receive digital voice, data, and video between vehicles and command and control facilities. These data link radios are being interfaced with a variety of computers and monitors. Even while newly designed systems proliferate, a wide range of legacy platforms are undergoing upgrade to incorporate new data link capability. Clearly, the need for a common data link (CDL) solution to be used in multiple applications exists.

Nowhere are communication system design paradigms being challenged more than in unmanned air vehicle (UAV) operations. Stimulated by increasingly sophisticated mission demands, and the availability of more complex sensor systems, specifically engineered for UAVs, as well as a technologically advanced enemy, the dimensions of the need are still evolving.

For some time, all DoD services as well as NATO allies have been working to create common standards for transmitting data to and from UAVs, making it easier to allow imagery such a full-motion video, readily available to more troops engaged in combat.

Bandwidth, in its simplest definition, is the rate at which information moves from one electronic device (node) to another. As such, the availability of bandwidth is a central issue in the design and operation of any communication system. As information has become digitized, and the demand for information (bandwidth) has grown, the limitations in many existing communication design paradigms have become increasingly obvious. UAVs today often transmit data in many different formats, complicating data sharing and video transmission between services and, frighteningly, even between units of the same service.

A relatively new common data link (CDL) compliant system is the tactical common data link (TCDL) which embodies characteristics most likely to meet the needs of the rapidly evolving demand envelope for both UAV and manned platforms. TCDL is a Ku-band digital data link that transmits wide-bandwidth information using CDL wave-form standards.

Employing a narrow Ku-band uplink for both payload and vehicle control and a broadband downlink for data transfer, the TCDL can provide full-duplex digital transmission between intelligence collection platforms and surface terminals. The TCDL system supports air-to-surface transmission of radar, imagery, video and other critical information at a range of up to 200 km (as used on platforms such as the Predator).

CTT is introducing new products designed for two important functional areas of TCDL. Often overlooked in the rush toward digital sophistication is the RF transceiver front end (Figure 1). CTT's solid-state, power and low-noise amplifiers are specifically designed to provide flexibility to the TCDL system designer for both the platform and surface communication elements.

Tactical Common Data Link (TCDL)

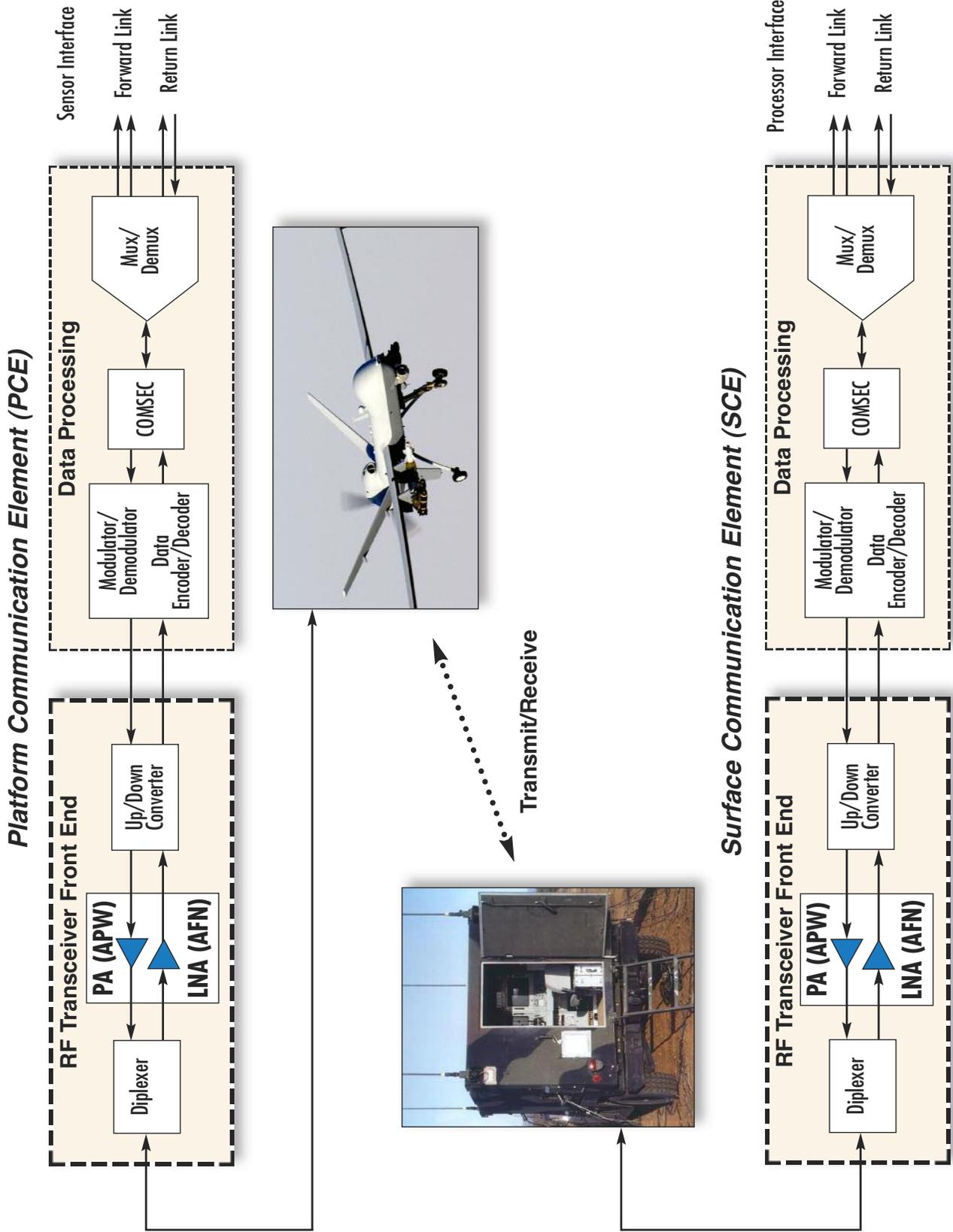


Figure 1. Tactical Common Data Link (TCDL) System Diagram



Engineered specifically to meet the rugged environment of TCDL operations, CTT's model APW/155-4340 (Figure 2) is a solid-state power amplifier which provides 20 watts of power across the instantaneous bandwidth of 14.0-15.5 GHz (Figure 3) making it suitable for use on a variety of platforms, depending on configuration (i.e: duplex or transmit only). Additional specifications include 58 dB of small signal gain, 4.9 dB noise figure, and a compact size of 3.9 (L) in. x 3.5 (W) in. x 0.67 in. (H). Ideal as a companion amplifier of TCDL receivers is CTT's newest LNA design, the AFN/155-1530. Optimized for operation from 14.0 to 15.5 GHz, this amplifier allows front-end noise figures of <1.5 dB. Additionally, this new LNA provides gain of 30 dB min. in a drop-in package measuring only 1.6 in. (L) x 0.66 in. (W) x 0.22 in. (H) (Figure 4). Thus, when combined together, a complete RF front end solution is available for both airborne and ground terminals.



Figure 2. Model APW/155-4340 Solid-State Power Amplifier

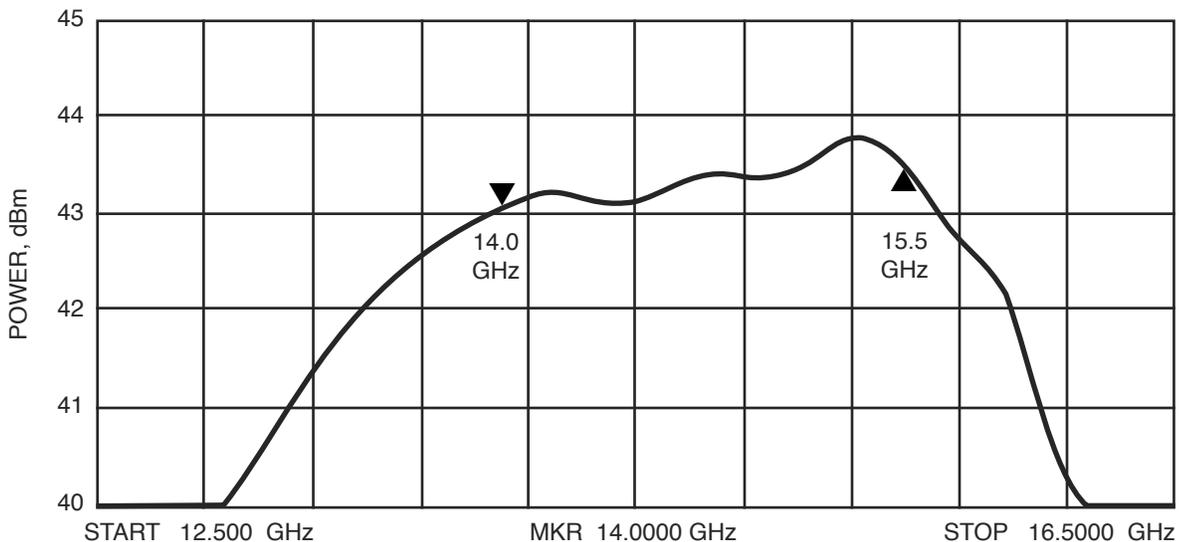


Figure 3. Psat vs Frequency



**Figure 4. Model AFN/155-1530
Solid-State Low-Noise Amplifier**



**Figure 5. USA-based, fully automated,
thin-film microwave production facility**

The RF transceiver front end continues to be one of the most vital functions in providing real time connectivity and interoperability among an array of manned and unmanned intelligence, surveillance and reconnaissance (ISR) and electronic warfare (EW) systems.

As such, it is important to emphasize the fact that both the APW and the AFN amplifiers are built and inspected to meet the requirements of MIL-STD-883, Methods 2010 and 2017, with soldering compliant to J-STD-001, while having all internal components screened to MIL-STD-883, Method 5008. These procedures also make both amplifiers excellent choices for applications requiring MIL-E-5400. This specification covers the general requirements for airborne electronic equipment for operation primarily in piloted aircraft.

CTT has shipped more than 1,500 amplifiers into many UAV programs including Hunter, Shadow and Predator. CTT's design of both the APW/155-4340 and the AFN/155-1530 as data link amplifiers is the refinement of several decades of amplifier and subassembly experience. In addition to this design heritage, both amplifiers take full advantage of the repeatability and cost effectiveness of CTT's fully automated in-house production line (Figure 5).

CTT, Inc., established in 1981, is a privately-held company located in Silicon Valley. The Company designs and manufactures GaAs and GaN-based solid-state microwave amplifiers and subassemblies for the domestic and international defense electronics and commercial communications markets. For additional information contact: CTT, Inc, 241 East Java Drive, Sunnyvale, Calif. 94089, Phone: 408-541-0596, Fax: 408-541-0794, Web: www.cttinc.com.